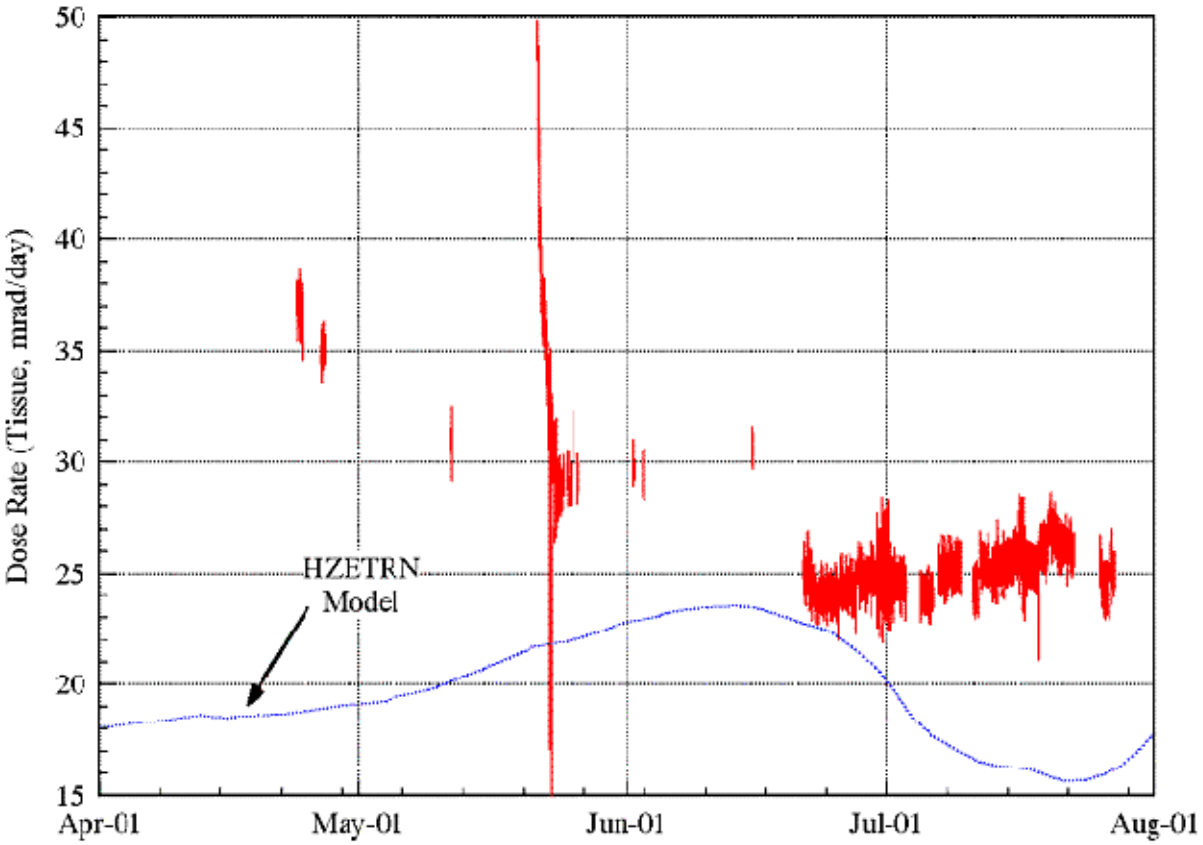
MARIE - Data Archives

Archived Radiation Dose Plots:

Dose Plot - April 2001 to August 2001

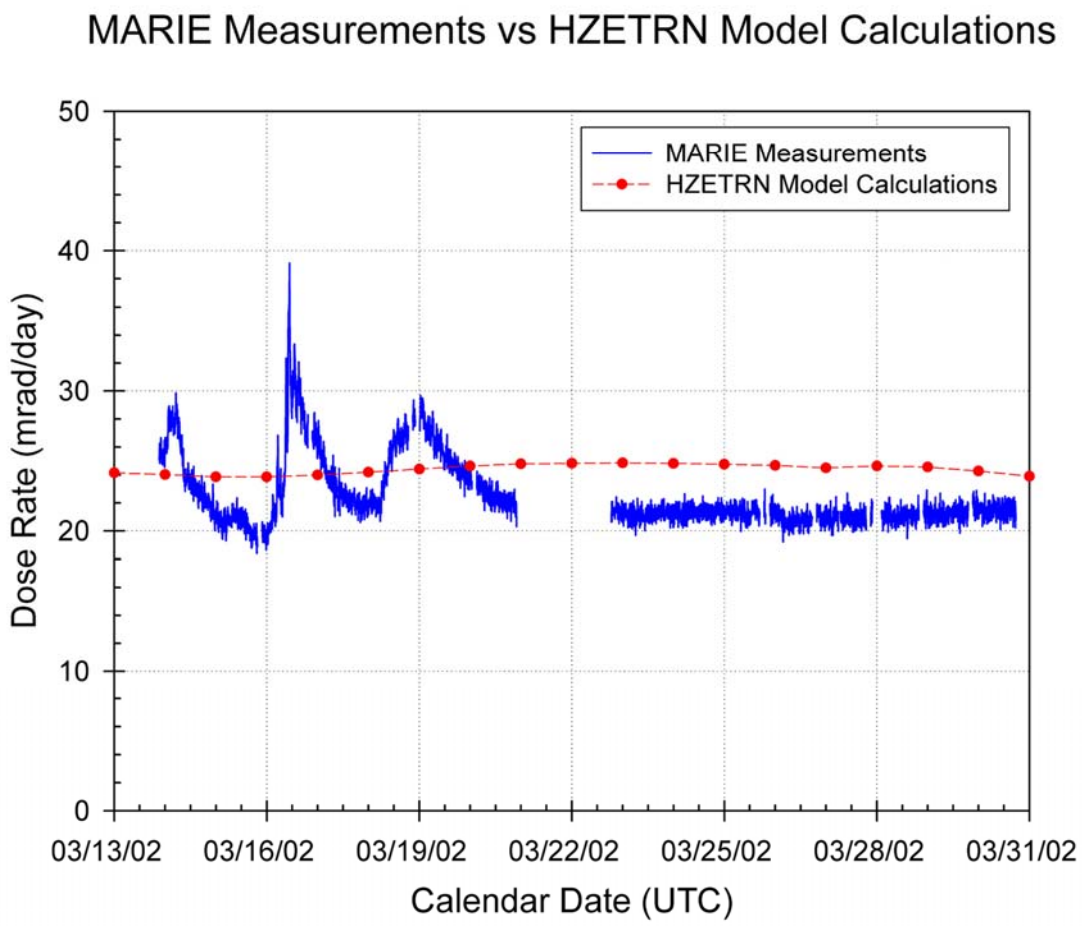


This figure plots the absorbed dose rate as a function of time since the unit was first powered up. The gaps in data are related to attempts to bring the trigger rate to the expected rates and in implementing the commands.

The spike in dose rate around May 22 is due to the solar particle event (SPE). Only the decay portion of the event was captured because the unit was powered off during the start of the event. The two rather small July SPE's do not appear to have added additional dose.

The solid line is the expected dose rate due purely to the Galactic Cosmic Radiation (GCR) component and includes transport through the spacecraft and detector shielding. The variations in dose rate are due to solar modulation, the solar deceleration potential varying from about 1050 to 1350 MV during this period.

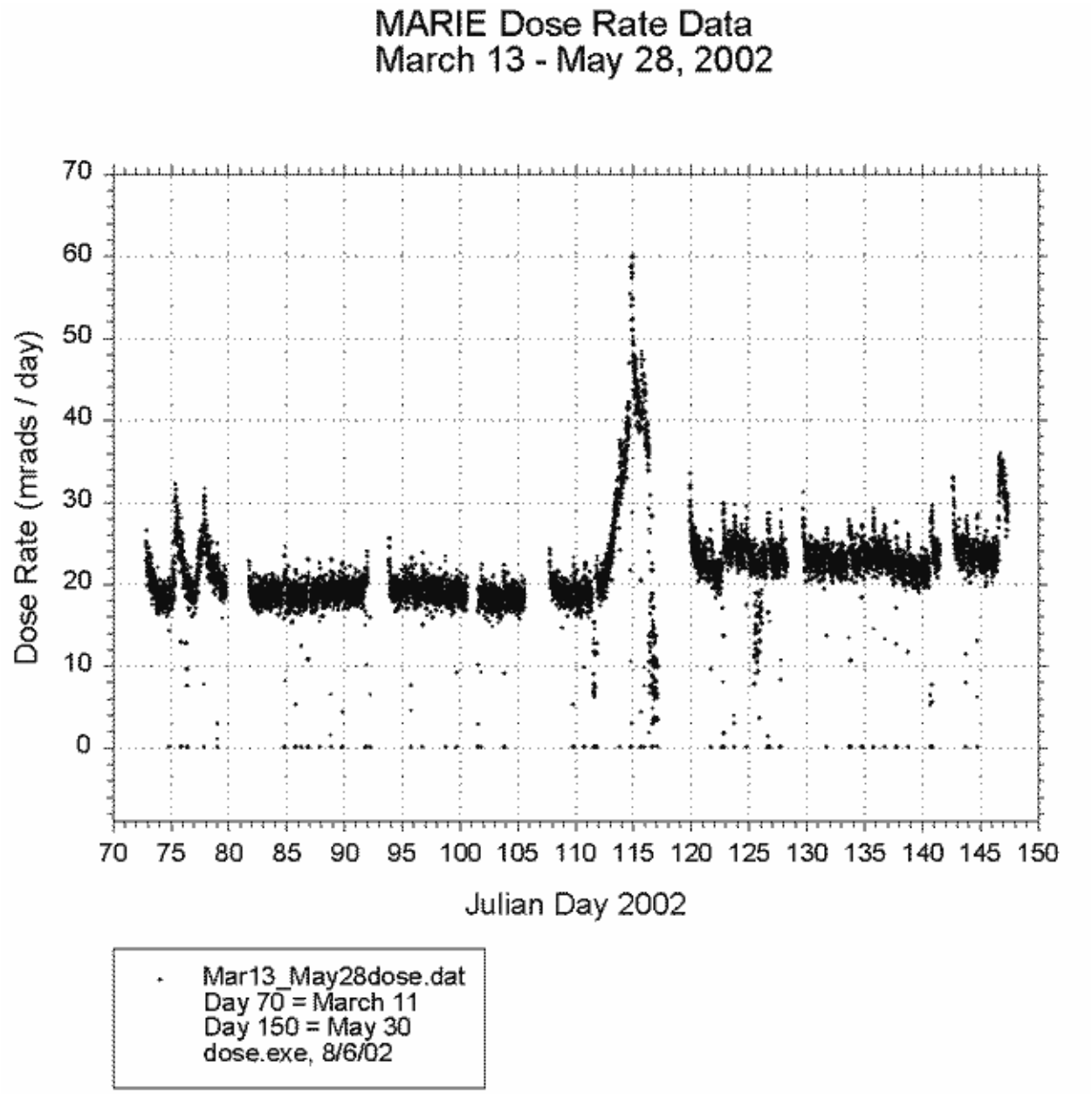
Dose Plot – March 2002



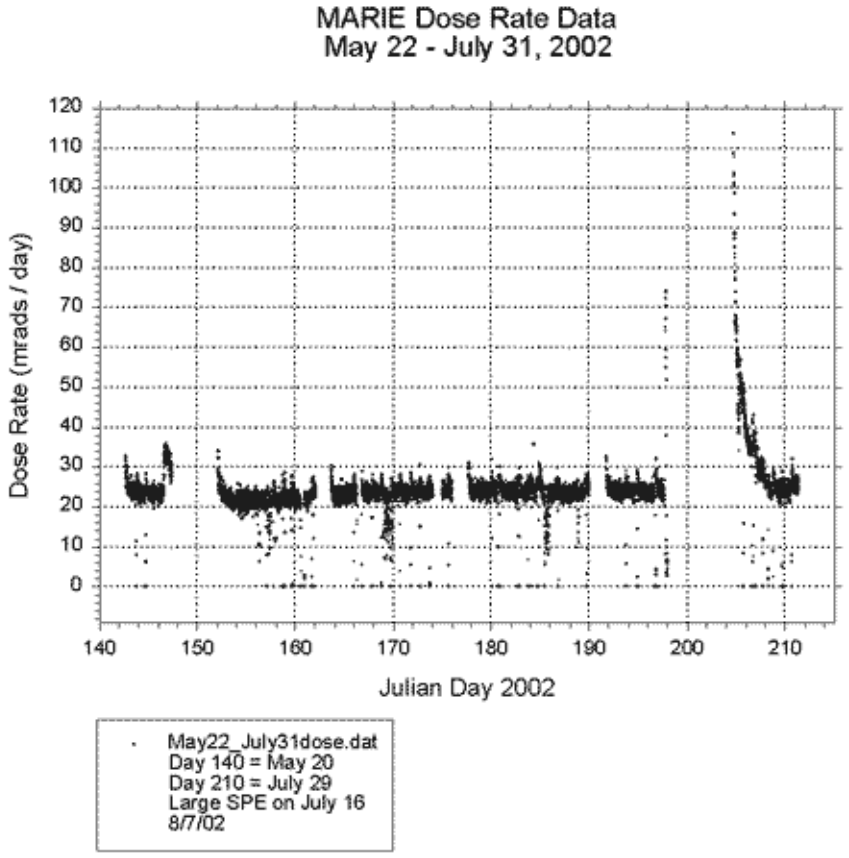
This figure plots the absorbed dose rate as a function of time since MARIE was powered up in March. The gaps in data are related to downloads and housekeeping tasks.

The solid line is the expected dose rate calculated from the HZETRN model utilizing the daily solar deceleration parameter, phi for the generation of the Galactic Cosmic Radiation spectra.

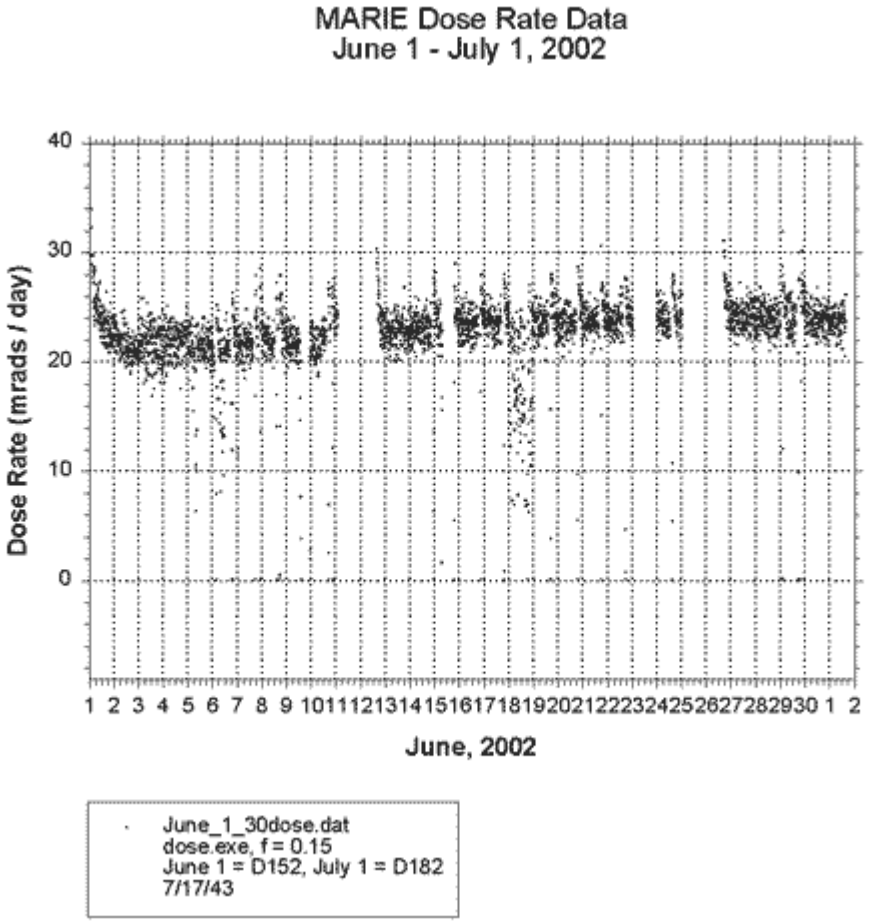
Dose Plot March 2002 to May 2002



Dose Plot May 2002 to July 2002

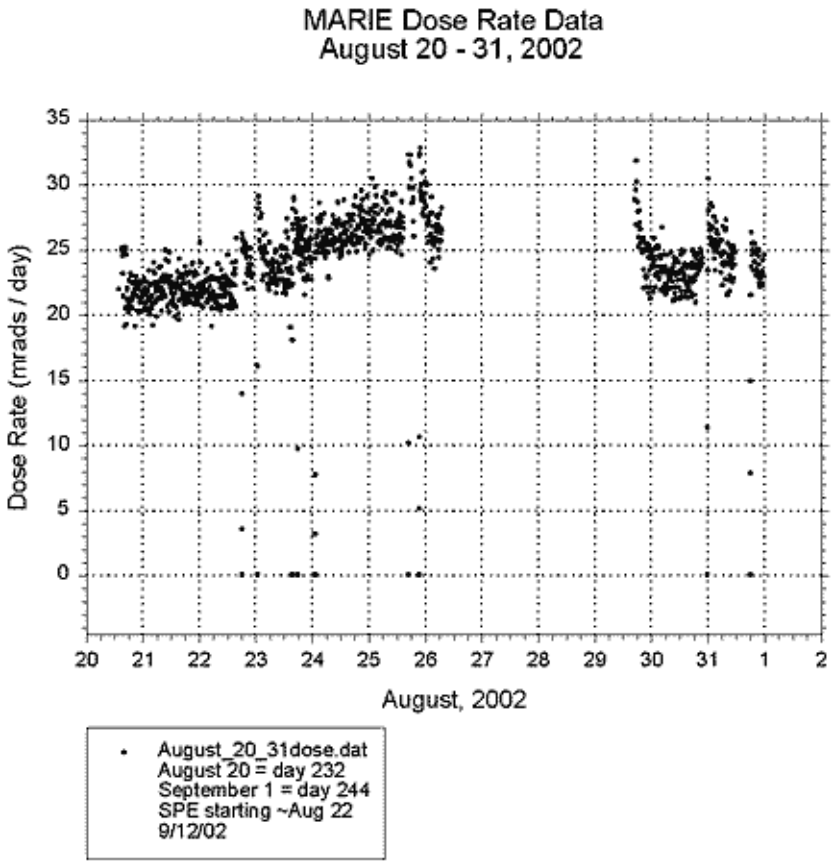


Dose Plot June 2002



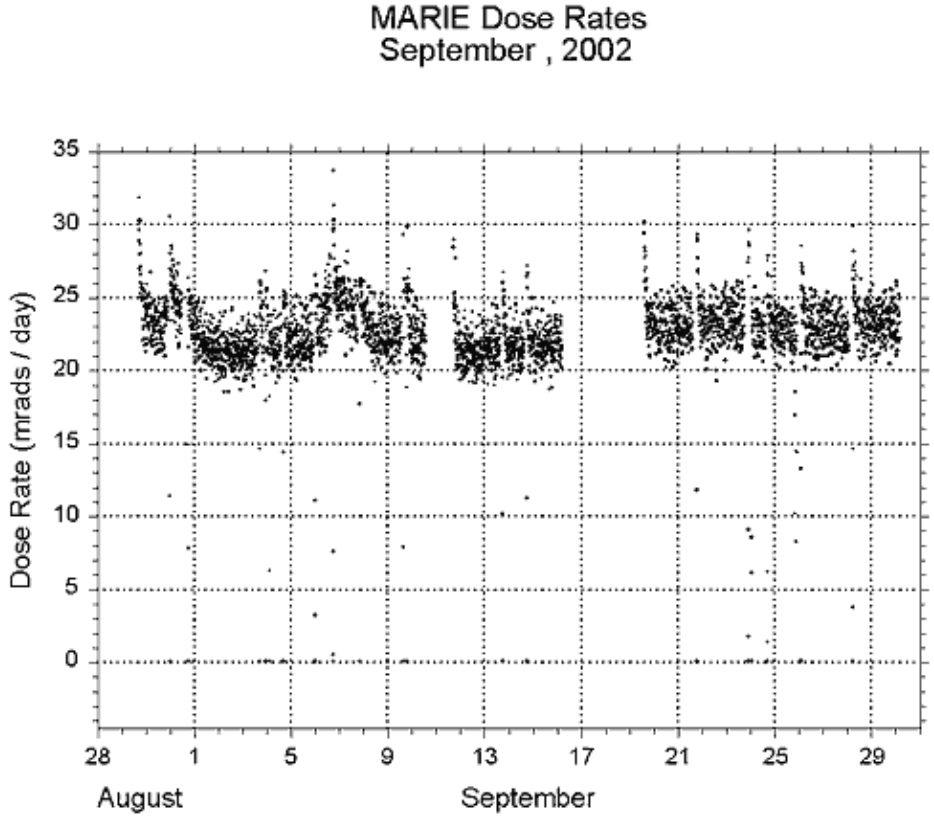
June was a fairly quiet month at Mars, averaging 20 - 24 millirads/day. The lower readings on June 18th are due to communication problems with the spacecraft. The gaps in the data are caused by download and erase operations, and the small spikes at the beginning of each data block are due to instrumental instabilities.

Dose Plot August 2002

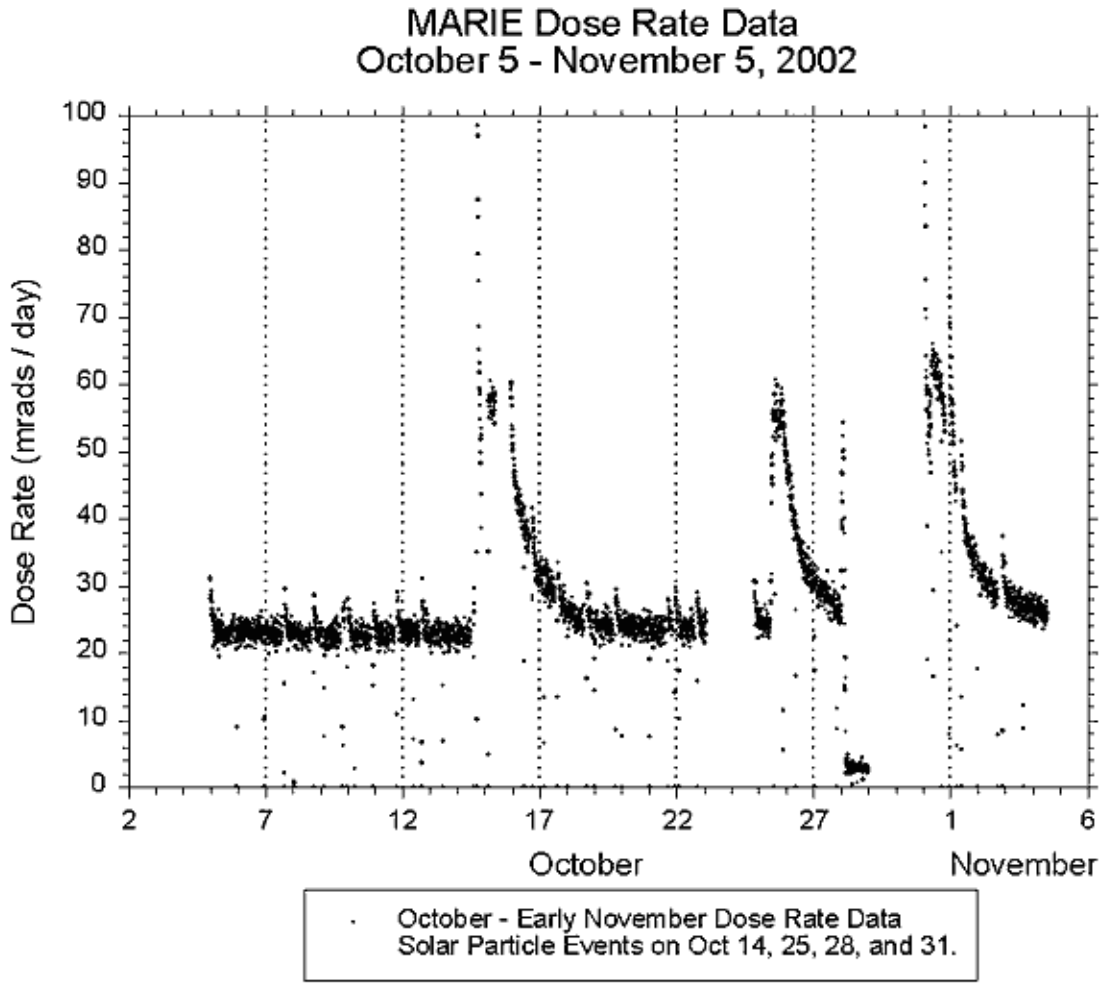


This dose rate plot is from August 20 through August 31. A small enhancement of the dose rate was observed starting mid-August 22, corresponding to the large solar particle events observed on the west limb of the sun on August 22 and August 24. Another slight enhancement is noted on August 30-31.

Dose Plot September 2002

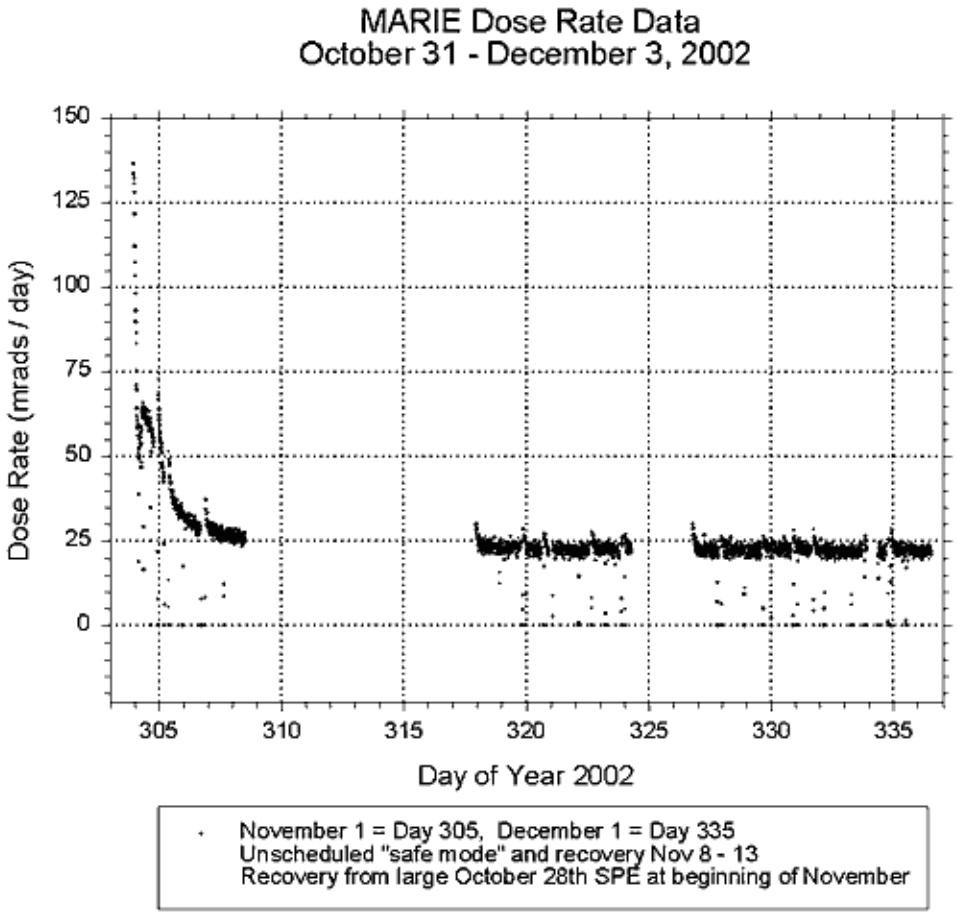


Dose Plot October 2002



This dose rate plot is for the period October 5 through November 4. There were four SPE's (Solar Particle Event) observed by MARIE, on the following dates in October: Oct 14, 25, 28, and 31. The only increase in activity observed by the GOES 8 satellite occurred as a slight increase in low energy protons on October 31, continuing until November 5. Thus these events represent the first solar particle events which were observed at Mars, but not in any meaningful way at Earth. The GOES enhancement was probably associated with the October 28th event, which was sufficiently large to saturate the MARIE A1-A2 trigger rate.

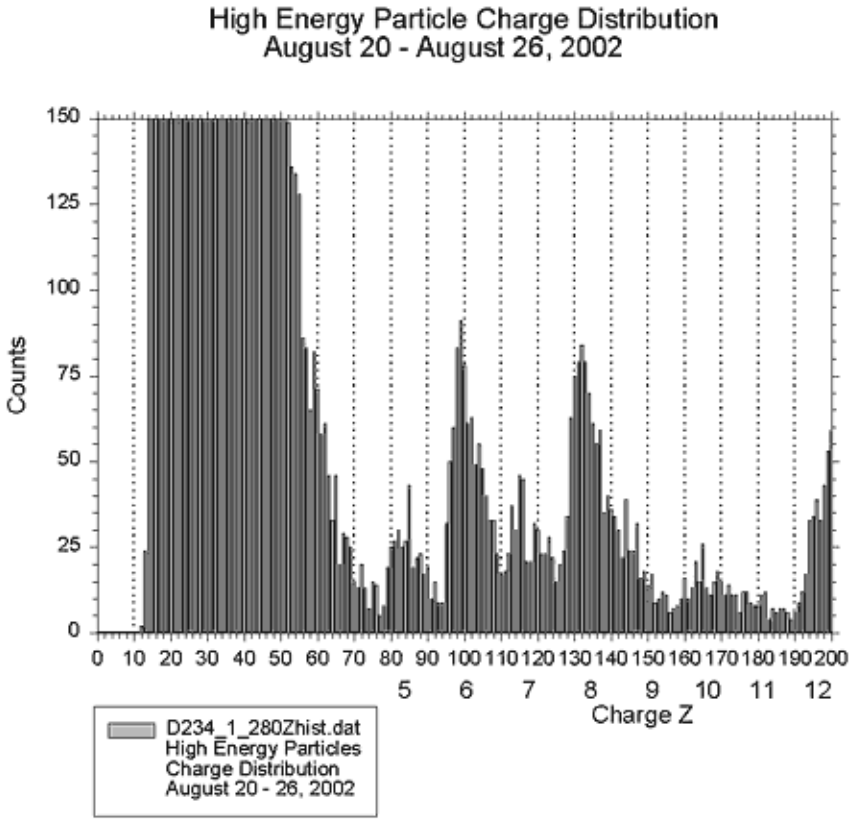
Dose Plot November 2002



November was a quiet month, compared to October, with the only noticeable enhancement being due to the decay of the large solar particle event on October 28th. (See the plot Marie A2 Count Rates October 28, 2002.) The normal method of calculating the dose rate is to analyze the A1A2 coincident count rate. Unfortunately on October 28 the A1A2 coincident count rate saturated due to the high particle rate.

Archived High Energy Particle Charge Distribution Plots:

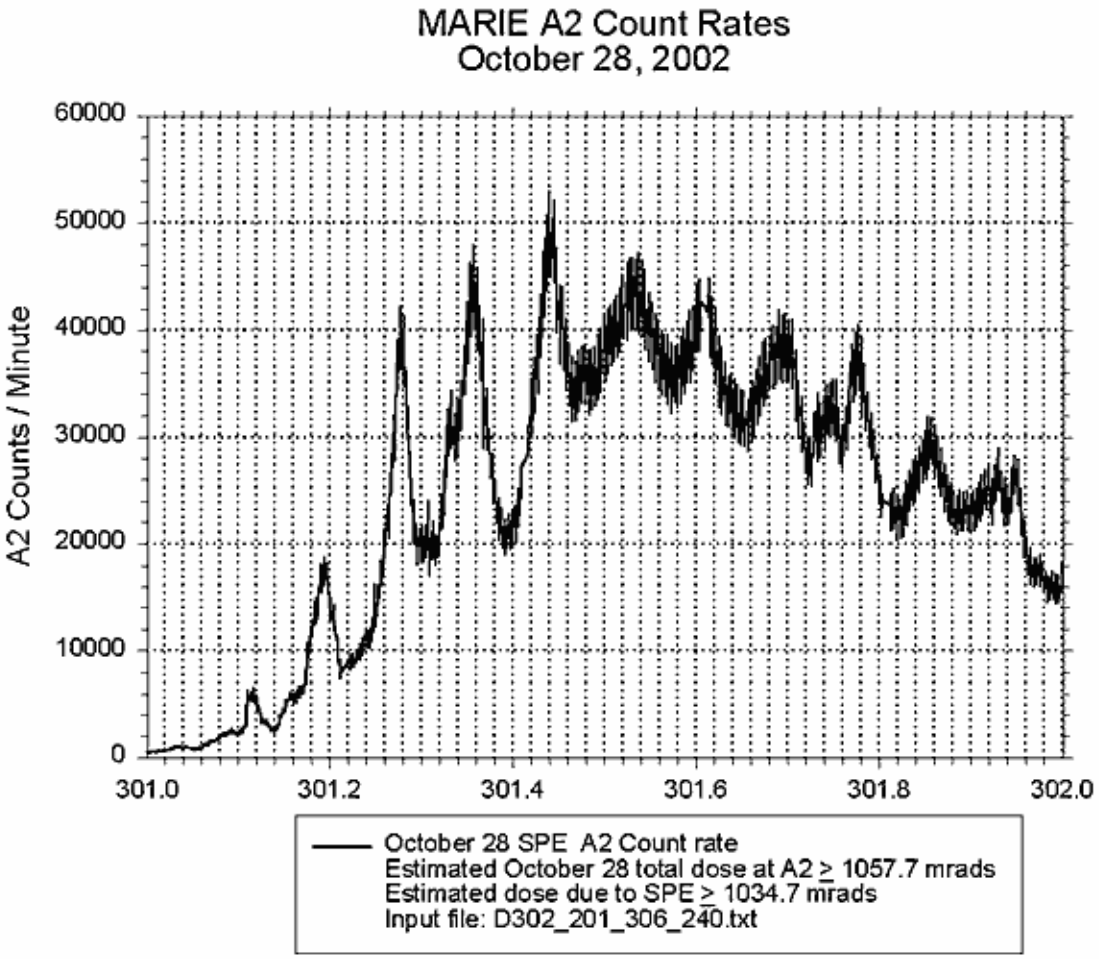
High Energy Particle Charge Distribution Plot August 2002



This second August plot shows the charge distribution for the high energy particles for the period August 20 - 26. The charge range ~4 to ~12 can now be resolved, although Z = 4 is hard to see due to the large proton and alpha peaks, and the statistics for odd charges 9 and 11 are still poor. The numbers on the x-axis represent the square root of the average B-detector energy deposition.

Miscellaneous Archived Plots:

A2 Detector Count Rates October 2002



Another method of calculating the dose rate is to use only the event counter for a single sensor. We can estimate the dose rate for this event from the count rate of the A2 detector, provided that the A2 detector does not "roll-over" at 64K, as happens often in the A1 detector during large SPE's. This figure shows the planetary shadowing as Odyssey passed behind Mars every 1.5 hours, indicating that the particle flux in this SPE was highly anisotropic. Unfortunately the data for day-of-year 303, (D303, October 30), was lost, due to a download. A similar analysis of D304 indicated that the small enhancement seen on D304 was consistent with planetary shadowing, instead of another pulse of particles. The dose rates calculated from the A2 counter data represent a lower limit of the true dose, due to the shielding around the detector.

For further information please see the MARIE website located at:

http://marie.jsc.nasa.gov/